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# Claims

[c1] An apparatus to communicate with a plurality of subsea wells located at a depth from the surface of a body of water, the apparatus comprising:

a floating platform including a dry tree apparatus configured to communicate with and service the subsea wells; and

a plurality of variable tension risers comprising a negatively buoyant region, a positively buoyant region, and a neutrally buoyant region between the negatively and positively buoyant regions, and configured to extend from the wells to the floating platform;

wherein the negatively buoyant region hangs below the floating platform and exhibits positive tension, the neutrally buoyant region is located between the negatively and positively buoyant regions and characterized by a curved geometry configured to traverse a lateral offset of at least 300 feet between the floating platform and the subsea well, and the positively buoyant region is positioned above the subsea well and exhibits positive tension.

[c2] The apparatus of claim 1 wherein the depth of water is greater than 4,000 feet.

[c3] The apparatus of claim 1 wherein the depth of water is less than 15,000 feet.

[c4] The apparatus of claim 1 wherein the depth of water is less than 10,000 feet.

[c5] The apparatus of claim 1 wherein the plurality of subsea wells is characterized by a maximum offset less than or equal to one half the depth from the surface of the body of water.

[c6] The apparatus of claim 1 wherein the plurality of subsea wells is characterized by a maximum offset greater than or equal to one tenth the depth from the surface of the body of water.

[c7] The apparatus of claim 1 wherein the plurality of subsea wells comprise vertically drilled wells and are free of slant and horizontally or partially horizontally drilled wells.

[c8] The apparatus of claim 1 wherein the floating platform is selected from spar platforms, tension leg platforms, submersible platforms, semi-submersible platforms, well intervention platforms, and drillships.

[c9] The apparatus of claim 1 wherein said floating platform is a dedicated floating production facility.

[c10] The apparatus of claim 1 wherein the variable tension risers terminate at the dry tree on the floating platform.

[c11] The apparatus of claim 1 wherein the variable tension risers terminate at a distal end of the floating platform.

[c12] The apparatus of claim 11 wherein the variable tension risers terminate at a pontoon structure of the floating platform.

[c13] The apparatus of claim 12 wherein the variable tension risers terminate at the pontoon structure on a single side of the floating platform.

[c14] The apparatus of claim 12 comprising spool connections connecting the variable tension risers at the pontoon structure to the dry tree.

[c15] The apparatus of claim 14 wherein the variable tension risers include second neutral buoyancy regions proximate to the distal end of the floating platform.

[c16] The apparatus of claim 1 wherein the variable tension risers include a rope and ballast line attachment point.

[c17] The apparatus of claim 1 wherein the variable tension

risers include a stress joint proximate to a connection with the subsea well.

[c18] The apparatus of claim 17 wherein said stress joint is curved.

[c19] The apparatus of claim 1 wherein the variable tension risers include a stress joint proximate to a distal end of the floating platform.

[c20] The apparatus of claim 19 wherein said stress joint is curved.

[c21] The apparatus of claim 1 further comprising a spacer ring making a connection between the neutral buoyancy regions and the negatively buoyant regions of the variable tension risers to restrict relative lateral movement and allow axial movement of the variable tension risers.

[c22] The apparatus of claim 1 further comprising anchor lines connecting the variable tension risers to a seafloor mooring to restrict movement of the variable tension risers.

[c23] The apparatus of claim 1 wherein the variable tension risers comprise tubing risers, single casing risers, or dual casing risers.

[c24] The apparatus of claim 23 wherein the variable tension

risers further include control lines.

[c25] The apparatus of claim 1 wherein the variable tension risers include a second negatively buoyant region between the positively buoyant region and the subsea well with positive tension in the riser proximate the subsea well.

[c26] The apparatus of claim 1 wherein the variable tension risers include a linking mechanism to link at least two variable tension risers together.

[c27] The apparatus of claim 26 wherein the linking mechanism links adjacent variable tension risers together in the first tension region.

[c28] The apparatus of claim 26 wherein the linking mechanism comprises rope.

[c29] A method to install a communications riser from a floating platform to a subsea wellhead, comprising:

deploying a wellhead connector mounted on a distal end of a first slick section of the communications riser;

attaching to the communications riser a guide and ballast line to be paid out and taken up from a floating vessel;

deploying a buoyed section of the communications

riser;

adjusting the guide and ballast line to counter any positive buoyancy of the buoyed section;

deploying a neutrally buoyant section of the communications riser;

deploying a second slick section of the riser;

manipulating the guide and ballast line to deflect the communications riser a lateral distance; and

lowering the communications riser to engage the wellhead with the wellhead connector.

[c30] The method of claim 29 wherein the wellhead connector, buoyed section, neutrally buoyant section, and second slick line section are deployed from the floating platform, and the guide and ballast line is manipulated with the floating vessel.

[c31] The method of claim 30 comprising forming a curved section in the neutrally buoyant section of the communications riser to traverse the lateral distance.

[c32] The method of claim 31 wherein the guide and ballast line comprises a heavy ballast chain.

[c33] The method of claim 31 wherein the guide and ballast line comprises a fine-tuning ballast chain.

[c34] The method of claim 29 further comprising paying out

and taking up the guide and ballast line to apply axial and lateral loads to guide the communications riser across the lateral distance.

[c35] The method of claim 30 further comprising using remotely operated vehicles to assist in the deflection of the communications riser.

[c36] The method of claim 29 wherein the neutrally buoyant section of the communications riser includes a heavy case section.

[c37] The method of claim 29 wherein the neutrally buoyant section of the communications riser includes a light case section.

[c38] The method of claim 30 wherein the floating platform is a semi-submersible platform.

[c39] The method of claim 30 comprising repeating the deployments, attachment, manipulation, and lowering to deploy a plurality of communications risers from the floating platform.

[c40] The method of claim 30 wherein the subsea wellhead is in water from 1,000 to 15,000 feet deep below the floating platform.

[c41] The method of claim 30 wherein the subsea wellhead is

in water from 4,000 to 10,000 feet deep below the floating platform.

[c42] The method of claim 29 further comprising a ballast weight and a stress joint proximate to the wellhead connector.

[c43] A variable tension riser to connect a subsea wellhead to a floating platform at a lateral offset of at least 300 feet, comprising:a first negatively buoyant region, a neutrally buoyant curved region, a positively buoyant region, and a second negatively buoyant region;

wherein the first negatively buoyant region hangs below the floating platform and exhibiting positive tension;

wherein the neutrally buoyant curved region is located between the first and second negatively buoyant regions;

wherein the positively buoyant region is positioned between the curved region and the second negatively buoyant region to create positive tension in the second negatively buoyant region;

wherein the second negatively buoyant region is positioned above and connected to the subsea wellhead; and

a communications conduit to allow communications from the floating platform to a wellbore of the sub-

sea wellhead.

[c44] The variable tension riser of claim 43 wherein the curved region traverses the lateral offset between the subsea wellhead and the floating platform.

[c45] The variable tension riser of claim 43 wherein the subsea wellhead is greater than 4,000 feet below the floating platform.

[c46] The variable tension riser of claim 43 wherein the subsea wellhead is less than 15,000 feet below the floating platform.

[c47] The variable tension riser of claim 43 wherein the subsea wellhead is less than 10,000 feet below the floating platform.

[c48] The variable tension riser of claim 43 wherein the lateral offset is less than or equal to one half of a depth of the subsea wellhead below the floating platform and more than on tenth of the depth.

[c49] The variable tension riser of claim 43 further comprising a second neutral buoyancy region proximate to the floating platform.

[c50] The variable tension riser of claim 43 further comprising a stress joint proximate to the subsea wellhead.

[c51] The variable tension riser of claim 43 further comprising an anchor line extending to a seafloor mooring to restrict movement of the variable tension riser.

[c52] The variable tension riser of claim 43 wherein the floating platform is a semi-submersible platform.

[c53] The variable tension riser of claim 43 further including a linking member connecting the variable tension riser to a second variable tension riser.

[c54] The variable tension riser of claim 43 wherein the positively buoyant region positively tensions the riser at the subsea wellhead connection.